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\*\* Oögonia aggregated.

§ Terminal divisions elongated, much longer than the primary; oöspore 275  $\mu$  long, membrane reticulated. *N. subglomerata* A. Br.

§§ Terminals abbreviated, less than half as long as the primary divisions.

*a.* Terminals one-half to one-fifth the length of the primaries, oöspore 240  $\mu$  long. *N. stellaris* Allen.

*b.* Terminals unequal, scarcely more than one-tenth the length of the primaries, oöspore 300  $\mu$  long. *N. capitulifera* Allen.

†† Sterile divisions somewhat exceeding the contracted, fertile verticils; oöspore 225  $\mu$  long, membrane smooth. *N. subspicata* Allen.

††† Sterile divisions long overtopping the globular condensed, fertile verticils; oöspore 400  $\mu$  long, membrane coarsely granular. *N. glomerulifera* A. Br.

## Internal Antidromy.

BY GEORGE MACLOSIE.

Prof. W. J. Beal showed in the *American Naturalist* of 1873 that cones of opposite spirality grew on the same pine tree. Although for a time I failed to see matters in this way, I have, with the assistance, or rather the guidance, of Prof. G. L. Goodale, come to endorse all that Prof. Beal wrote; and furthermore, I find that the phyllotaxy as well as the conotaxy is two-fold on different parts of the same tree of the Coniferae. The branches of succeeding years appear to be often relatively antidromic, and also the side branches along one of the primary branches, and each cone appears to harmonize in its spirality with the branch which bears it, though there are apparent exceptions to this rule which may be due to the suppression of branches. Of course these phenomena cannot be observed in non-branching Gymnosperms, as the cycads, nor in tree ferns.

But in the London Natural History Museum I found a branching specimen of *Lepidodendron Sternbergii* (from Lanarkshire, Scotland) in which the leaf scars of stem and of one branch were dextrorse, whilst those of the other branch of the dichotomy were sinistrorse. This phenomenon strongly recalled the conditions of the forking rootstock of the water lily (*Nuphar*) and other plants.

The general outcome of these facts is that the law of antidromy is more complex than was first apparent; a result which

was previously indicated by the internal antidromy of *Liquidambar*. I may add that the flowers on one plant of *Hibiscus Syriacus* show a tendency to twist in relatively opposite directions; and though the phyllotaxy of that species is not easily determined (the right and left spirals being almost similar), yet in some cases opposite orders of spirality can be found on neighboring branches.

My friend, Prof. F. E. Lloyd, informs me that in the cycadaeous species *Encephalartos Altensteinii* he finds the cones on the same tree relatively antidromic. This accords with the condition of the allied coniferous order.

PRINCETON UNIVERSITY, November 3, 1896.

### Reviews.

*Some Analogies in the Lower Cretaceous of Europe and America.*

Lester F. Ward. Reprinted from 16th Ann. Rept. U. S. Geol. Survey, Part I., 1894-1895 [Washington, 1896], pp. 463-542. *Plates xcvi.-cxviii. and illust. in text.*

This important contribution is of interest to both the botanist and the geologist on account of the use which is made of palaeobotanical evidence in the correlation of geologic horizons. The comparisons are chiefly made between the Potomac formation of America and the Wealden of Europe, and the author has taken a very broad and liberal view of what should be included under the latter, giving it a wider range at each extremity than is usually conceded to it. In this connection a plea is made for dual nomenclature in geology, according to the point of view from which observations are made. From the standpoint of fossils alone the Wealden would be restricted to narrower limits than if considered stratigraphically, that is from the standpoint of origin and manner of deposition of sediments.

Stratigraphically the Wealden would have to include part of what we have usually regarded as Jurassic with some of the lower Cretaceous. The method of formation and lithologic characters of the Wealden, as thus defined, evidently correlate it very closely with our lower Potomac formation, that is to say the strata are largely of estuary or fluvial origin and consist of alternating sands